

Supplementary Information

Genetically encoded nanostructures enable acoustic manipulation of engineered cells

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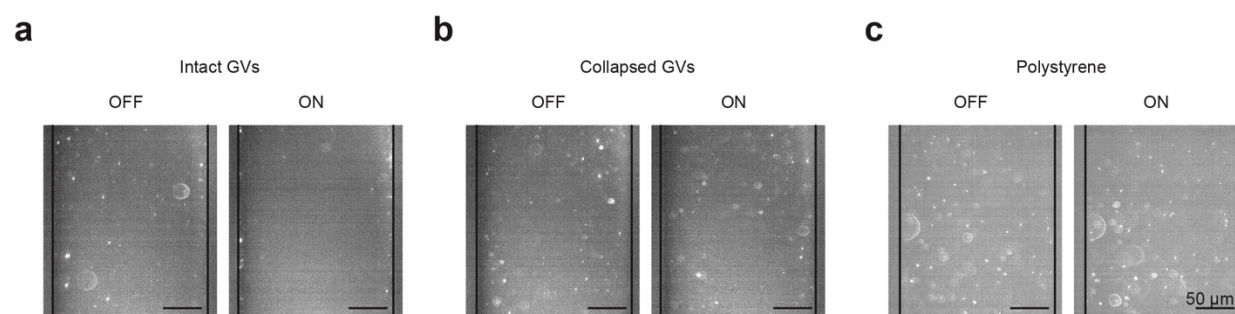
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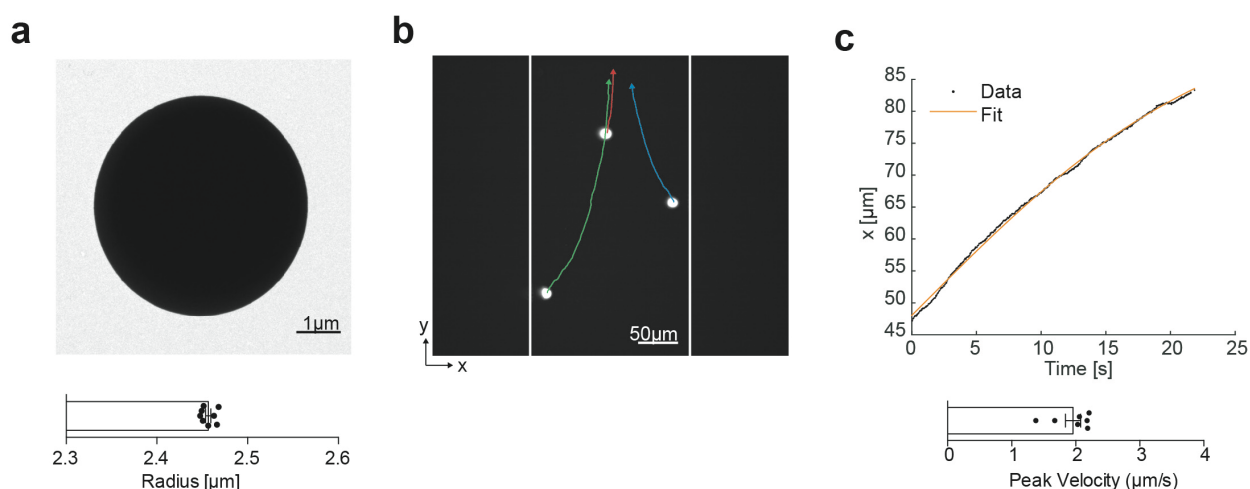
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Supplementary Figures

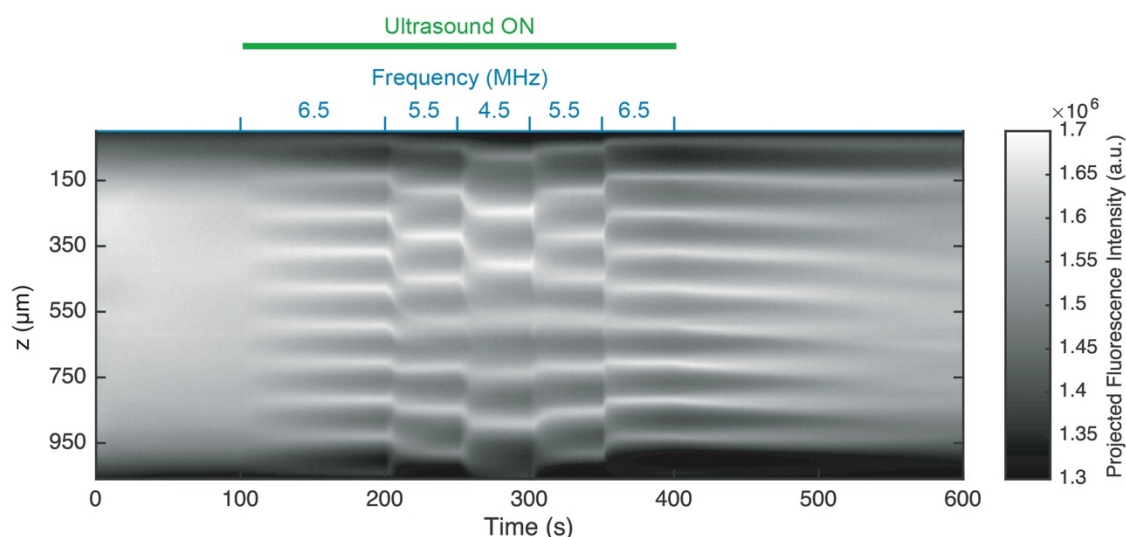


Supplementary Fig. 1 | Control particles do not experience substantial ARF. Fluorescence images of intact GVs (**a**), pressure-collapsed GVs (**b**), and polystyrene nanoparticles (**c**) inside the microfluidic channel before ultrasound (OFF) and 100 seconds after ultrasound has been turned on (ON). Device and acoustic conditions are as described in Fig. 2.



Supplementary Fig. 2 | Calibration of the acoustic energy inside the acoustofluidic channel.

a, Representative TEM image of a polystyrene particle (top) and quantification of the particle radius (bottom, $2.457 \pm 0.003 \mu\text{m}$, mean \pm S.E.M., $n=7$). **b**, Fluorescence image and overlaid acoustophoretic trajectory of polystyrene particles inside the acoustofluidic channel. The white lines demarcate the edges of the channel. Arrows indicated direction of particle movement. **c**, Representative single-particle trajectory in the x-direction during ultrasound stimulation (top), and quantification of the peak particle velocity (bottom, $2.0 \pm 0.1 \mu\text{m/s}$, mean \pm S.E.M., $n=7$). The acoustic energy is determined using the radius, peak velocity, and the acoustic contrast factor of polystyrene particles (**Fig. 1e**).



Supplementary Fig. 3 | Cell patterns can be reconfigured on the timescale of seconds.

Kymograph of projected fluorescence signal from *arg1*-expressing *E. coli* during the application of ultrasound at different ultrasound frequencies. Conditions as described in **Fig. 5, a-b**.



Supplementary Fig. 4 | Bacteria cluster formation requires intact intracellular GVs. Fluorescence images of *arg1*-expressing *E. coli* with intact (+) and collapsed (-) intracellular GVs before and 40 seconds after ultrasound application.